



NATIONAL INSTITUTE OF SCIENCE & TECHNOLOGY (Autonomous)
(APPROVED BY AICTE, NEW DELHI, AFFILIATED BY BPUT,
ROURKELA)
INSTITUTE PARK, PALUR HILLS, BERHAMPUR, ODISHA - 761008



Department of Civil Engineering

Third Semester Syllabus

Batch: 2022-2026

NIST Institute of Science and Technology
(Autonomous) Berhampur

Third Semester					
Theory					
Sl. No.	Category	Subject Code	Subject Name	L-T-P	Credit
1	BSC	22CM3BS01T	Mathematics-III	3-0-0	3
2	HSMC	22CM3HS01T	Organisational Behaviour	3-0-0	3
		22CM3HS02T	Engineering Economics and Costing		
3	ESC	22CM3ES01T	Data Structure using C	3-0-0	3
4	ESC	22CE3ES02T	Construction Materials and Techniques	3-0-0	3
5	PCC	22CE3PC01T	Surveying	3-0-0	3
6	PCC	22CE3PC02T	Mechanics of Materials	3-0-0	3
7	MC	22CM3MC01T	Environmental Science and Engineering	3-0-0	0
Total Credit (Theory)					18
Practical					
1	ESC	22CE3ES02L	Material Testing Laboratory	0-0-2	1
2	ESC	22CM3ES01L	Data Structure using C Laboratory	0-0-2	1
3	PCC	22CE3PC01L	Surveying Laboratory	0-0-2	1
4	PCC	22CE3PC02L	Mechanics of Materials Laboratory	0-0-2	1
5	PSI	22CM3PS01L	Summer Internship/Summer Training/Mooc Course	0-0-2	1
Total Credit (Practical)					5
Total Semester Credit					23

Course Code: 22CM3BS02T	Course Name: Mathematics-III	L-T-P: 3- 0- 0	Credit: 03
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Course Objectives: The course should enable the students to:

1. Enrich the knowledge of numerical analysis to find the root and interpolating polynomial.
2. Apply the concept to find numerical differentiation and integration. Solve first order ordinary differential equation.
3. Apply the concept of Numerical analysis to enrich the knowledge of complex numbers, and complex functions.
4. Apply the knowledge of complex analysis to solve various integrations.

Syllabus:

Module – I: Root Finding and Interpolation [8 Hours]

Root Finding: Introduction, Root finding by Bisection Method, Newton-Raphson Method, Regula-Falsi Method, Secant method, Fixed point method.

Interpolation: Lagrange, Newton forward and Backward, Divided Difference Method.

Module – II: Numerical Differentiation and Integration [8 Hours]

Differentiation: Derivative using Newton's forward and backward difference formula.

Integration: Trapezoidal Method, Simpson's 1/3rd and 3/8th rules, Gauss-Quadrature 2 - point & 3- point method.

Module – III: Numerical Solution of Ordinary Differential Equation [7 Hours]

First Order Differential equation by Taylor's series Method, Euler's method, Modified Euler's method, Runge-Kutta 4th order, Predictor & Corrector methods (Adams-Bashforth Method of order 4).

Module – IV: Complex Functions, Line Integral [9 Hours]

Complex Functions: Analytic function, C-R equation, Laplace equation, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic function.

Complex Integration: Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of Analytic functions.

Module – V: Power series, Taylor series, Laurent series, Residue [8 Hours]

Sequences, Series, Power series, Functions given by power series, Taylor and Maclaurin series, Laurent series, Singularities and Zeros, Residues, Residue integration method.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, Tenth Edition, Willey.
(Chapter: 13, 14, 15 (15.1 – 15.4), 16 (16.1 – 16.3), 19 (19.1 – 19.3, 19.5), 21 (21.1 - 21.2))

Reference Books:

1. M. K. Jain, S. R. K. Iyenger and R. K. Jain, Numerical Methods for Scientific and engineering Computations, New Age International Publication (P) Ltd.
2. B. V. Raman, Higher Engineering Mathematics, Mc-Graw Hills Education.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

Course Outcomes: On completion of this course, students are able to:

1. Use the knowledge of numerical analysis to find the root and interpolating polynomial.
2. Solve various differentiation and integration by numerical methods. Solve the first order ordinary differential equation by the concept of Numerical analysis
3. Increase the knowledge about the complex plane and complex functions
4. Solve various integrations by the help of complex analysis.

Course Code:	Course Name:	L-T-P:	Credit:
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22CM3HS01T	Organisational Behaviour	3- 0- 0	03
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Course Objectives:

1. Developing an understanding of the behaviour of individuals and groups inside organizations by enhancing the skills in appreciating individual, interpersonal, and group processes for increase.
2. Developing effectiveness both within and outside of organizations is the goal of any organisation.
3. Through this course students will develop theoretical and practical insights.
4. The students will develop problem-solving capabilities for effectively managing the organizational processes.

Syllabus:

Module-I: Fundamentals of OB

[6 Hours]

Introduction: Definition, nature and scope of OB (environmental and organizational context), Relationship between OB and the individual, Impact of IT, globalization and diversity on OB.

Module-II: Foundations of Individual Behaviour

[10 Hours]

Personality: Meaning and definition, Determinants of personality, Personality traits, Personality and OB. Perception: Meaning and definition, Perceptual process, Importance of perception in OB. Motivation: Nature and importance, Herzberg's Two Factor Theory, Maslow's Need Hierarchy Theory, Alderfer's ERG Theory. Attitude: Definition, nature and dimensions, Attitude and OB. *Learning: Nature, learning and OB.*

Module-III: Group Dynamics of OB-I

[8 Hours]

Communication: Types, interactive communication in organizations, barriers to communication, strategies to improve the follow of communication. Stress and Conflict: Meaning and types of stress, Meaning and types of conflict, Effect of stress on individuals, strategies to cope with stress and conflict.

Module-IV Group Dynamics of OB-II

[6 Hours]

Power and Politics: Meaning and types of power empowerment. Groups Vs. Teams- Nature of groups, dynamics of informal groups, dysfunctions of groups and teams, teams in modern work place.

Module-V Foundations of Organizational Behaviour

[6 Hours]

Organizational Culture: Culture and organizational effectiveness. Organizational Change: Types of change, reasons to change, resistance to change. *Organisational Structure and Development: Concepts and process.*

Course Outcomes:

1. Students will understand the essential of maintaining the inter-personal relationships in organisations.
2. Personality factors will be effectively used to understand the communication among groups.
3. The reasons for conflict will be known and prescriptive methods can be devised to enhance higher productivity in organisations.
4. Being an employee in an organisation the importance of organisational change and culture can be known to all.

Text Book:

1. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.

Reference Books:

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Hitt, Miller, Colella, Wiley
3. Organizational Behaviour, K. Awathappa, HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Understanding Organizational Behaviour, Parek, Oxford

Course Code: 22CM3HS02T	Course Name: Engineering Economics and Costing	L-T-P: 3- 0- 0	Credit: 03
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Course Objectives: At the end of the course the engineering students will be able:

1. To prepare engineering students to understand the basic concepts of Engineering economics and their application.
2. To carry out numerically the effects of changes in demand and supply on price determinations of products and services.
3. To justify or reject alternative projects in the light of changing domestic and global scenario on the eve of technological innovations.
4. To analyse the macroeconomic environment and financial system of the country and its impact on business society and enterprise

Syllabus:

Module-I: [10 Hours]

Engineering Economics: Nature and Scope, Basic Problems of an Economy, Micro and Macro Economics; Demand: Meaning of demand, Determinants of demand, Demand function, Law of demand and its exceptions, Elasticity of demand and its measurement, (Simple numerical problems to be solved). Supply: Meaning of Supply, Determinants of Supply, Supply function, Law of Supply and its exception, Elasticity of Supply.

Module-II: [7 Hours]

Production: Factors of Production, Production Function; Laws of Returns: Law of Variable Proportions, Law of Returns to Scale, Cost and Revenue Concepts: Short Run Total Costs, Long Run Average Cost Curves, Total Revenue, Average Revenue and Marginal Revenue,

Module-III: [6 Hours]

Market Structures: Basic understanding of different Market Structures; Determination of Equilibrium Price under Perfect Market Competition and Monopoly. *Margin of safety and Break Even Analysis*: Linear Approach (Simple numerical problems to be solved).

Module-IV: [10 Hours]

Time Value of Money: Interest- Simple and Compound, Nominal and Effective Rate of Interest, Cash flow diagrams, Principles of Economic Equivalence, Evaluation of Engineering Projects:

Present, Future and Annual worth Method, Rate of Return Analysis; Cost-Benefit Analysis

Module-V:

[7 Hour]

Inflation: Meaning of Inflation, Types, Causes and Measures to Control Inflation. National Income: Definition, Concepts of National Income and its measurement, Banking: Commercial Bank, Functions of Commercial Bank, Central Bank, Functions of Central Bank.

Course Outcomes:

1. Students will understand how to solve economic problems and the art of taking the right decision on scarce resources.
2. This will help to solve different microeconomic problems related to production, cost, and revenue maximization
3. Students will be understood different market structures and levels of competition and determine the price
4. This will help engineering students while evaluating and determining the cost of a project. This is also helpful in determining the value of money for future courses of action.
5. This will help to understand basic microeconomic concepts like inflation, national income, and money market.

Text Books:

1. Principles of Economics: Deviga Vengedasalam & Karun agaran Madhavan-Oxford Publication

Reference Books:

1. Engineering Economics and Costing: D. M. Methani & Suresh Chandra Das-Himalaya Publishing House
2. Engineering Economics and Costing: Sasmita Mishra-PH Learning Private Limited
3. R.Panneerselvam, 'Engineering Economics', PHI



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4. Riggs, Bedworth and Randhwa, 'Engineering Economics', McGraw Hill Education India
5. Engineering Economics and Costing: Mahendra P. Agasty, Scitech Publications (INDIA) Pvt. Ltd.

Course Code: 22CM3ES01T	Course Name: Data Structures using C	L-T-P: 3- 0- 0	Credit: 03
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Course Objectives:

1. Implementation of different linear data structure.
2. Implementation of non-linear data structures like trees and graphs.
3. Applying different sorting and searching algorithms.

Syllabus:

Module-I: [10 Hours]

Abstract Data Types – Definition and Representation, ADT of rational number, ADT of Stack, Data Structure and ADT. Stack and its usages: reversing string, matching parentheses, infix to postfix, decimal to binary number. Queue: linear & circular queue, Deque & Applications. Matrix – sparse and dense. Representation of sparse matrix, Transpose & addition of sparse matrices.

Module-II: [8 Hours]

Linked list and its representation: using array, using self referential structure. Singly, circular and double linked lists. Operations on linked list – Insertion, Deletion, Traversals. Usages of Linked list – insertion sort, Addition/multiplication of polynomials. Addition/Multiplication of large numbers.

Module-III: [12 Hours]

Tree: Definition and Terminologies, child and parent nodes, Sub tree, root, leaf node, internal node, height of a tree. Binary, ternary, quad tree. Binary tree traversals. Reconstruction of binary tree from traversals. Binary search tree – inserting a new key, deleting a key, searching a key. AVL tree – inserting a new key into an AVL tree using rotations. B- tree : insertion and deletion using node splitting and merging.

Module-IV: [6 Hours]

Sorting and Searching: Bubble sort, selection sort quick sort and merge sort. Linear and binary search, Fibonacci search.

Module-V:

[6 Hours]

Basic Graph Algorithm: Graph representation – adjacency matrix and list – pros and cons.

Graph traversals – Depth First Search and Breadth First Search.

Course Outcomes:

1. Apply the basic data structure like stack, queue, linked list, tree and graph on different problems.
2. Compare and differentiate different implementation of data structure.
3. Analyzing the time complexity and space complexity of different sorting and searching algorithms and data structures implementation.

Text Books:

1. Data Structures: A Pseudocode Approach with C – Gilberg & Forouzan, 2nd Edition, Cengage, Indian Reprint 2016
2. Data Structures and Program Design in C – Kruse, Leung, 2nd Edition, Pearson, 2008.

Reference Books:

1. Data Structures Using C - Yedidyah Langsam & Moshe J. Augenstein Aaron M. Tanenbaum, 3rd Edition, Pearson, 2009
2. Algorithms and Data Structures: The basic toolbox, Kurt Mehlhorn and Peter Sanders, Springer, 2010
3. Programming and Data Structures (NPTEL) – (Vodeo lectures by Dr. Naveen Garg, IIT

Subject Code: 22CE3ES02T	Subject Name: Construction Materials and Techniques	L T P: 3 0 0	Credit: 3
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Course Objective (COB)

1. To understand the role of civil engineers and accomplishment in civil engineering profession.
2. To understand the physical and mechanical properties of construction materials and their respective testing procedure.
3. To know the building materials available in market for construction purpose.
4. To learn the principles and methods to be followed in construction of various civil engineering structures.
5. To learn different types of scaffolding and centering in building construction.

Module-I (08 Hrs)

Materials and their Properties:

Physical and Mechanical properties of construction materials: commonly used types of stones Tests for stones, road aggregates and concrete aggregates, Recycled Aggregates, properties of sand, BIS specification for testing of aggregates. **Bricks:** Properties and testing methods for bricks, **Cement:** Manufacturing, wet and dry processes, constituents and constitution, properties, Types of cement, Testing of Cement, **Concrete:** Production, mix proportions and grades of concrete, fresh, mechanical and durability properties of concrete, factors affecting properties of concrete, tests on concrete, admixtures,

Module-II (08 Hrs)

Special concrete: light weight concrete, high density concrete, vacuum concrete, shotcrete, steel fibre reinforced concrete, polymer concrete, Ferro cement, high performance concrete, self - compacting concrete.

Timber: Types, Seasoning and various products, Market forms, Plywood, Veneer, False ceiling materials, Glass, Ceramics, Refractories, **Composite Materials:** Types and applications, FRP, Fibre textiles, Geomembranes and Geotextiles for earth reinforcement. Paint: types, distemper, varnish, Adhesive Types, Bitumen: types, properties and tests.

Module-III (08 Hrs)

Roofing Materials and Modern Construction Materials:

Structural Steel and Aluminium, Roofing Material, Physical descriptions of asbestos sheets, GI GCI sheets and other state of art lightweight materials, tubes and light weight roofing materials, **Modern materials:** thermocole, decorative panels and laminates, architectural glass and ceramics, ferrocement, PVC, polymer based materials, RCC and composites, fibre reinforced plastics.

Module-IV (08 Hrs)

Construction Components:

Principles of construction: Selection of suitable type of masonry, Stone Masonry, Brick Masonry, Hollow block masonry, Reinforced brick work, Plastering and pointing, its purpose, Damp proof Course (DPC), Anti-termite measures and Treatments, **Construction Joints:** need and materials used, **Cavity wall:** components and construction, **Arches:** Terminology and classifications Doors

and **Windows:** Types, materials used, **Fire resistant construction:** Fire resistant properties of common building materials, requirements for various building components, Shuttering and Centering.

Module-V (08 Hrs)

Prefabricated Construction:

Prefabricated panels and structures: production, transportation and erection of structures- Types of projects; Stages of projects; Participants in projects and their role, Project failures and their causes, Case studies

Course Outcomes (CO)

1. Identify the relevant physical and mechanical properties of construction materials.
2. Apply the modern construction materials and roofing materials appropriate to the climate and functional aspects of the buildings.
3. Describe the principles and methods involved in prefabricated construction.
4. Decide construction technique to be followed in brick, stone and hollow block masonry, concreting, flooring, roofing, plastering and painting etc
5. Apply various types of scaffolding and its applications in construction.

Text Books:

1. A Text-Book of Building Construction, S.P.Bindra and S.P.Arora, Dhanpat Rai Publications
2. Building Materials and Construction, J. Jena and G. C Sahu, Mc. Graw Hill.

Reference Books:

1. Materials for Civil and Construction Engineers, Mamlouk and Zaniewski, Pearson
2. Building Materials and Building Construction, by P C Verghese
3. Building Construction, by B. C. Punmia, , Laxmi Publicaton

Subject Code: 22CE3PC01T	Subject Name: Surveying	L T P: 3 0 0	Credit:3
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Course Objectives

1. Students will learn different methods of surveying for a location and engineering applications and use of surveying instruments
2. Students will learn the use of surveying instruments e.g. levels, theodolites and advanced surveying instruments
3. Students will learn about referencing systems, horizontal and vertical control, and topographic mapping.
4. Students will learn how to prepare the layout of building and setting out of curve.
5. Students will learn about the electronic distance measurement equipment's.

Module I: (08 Hours)

Conventional Methods of surveying:

Linear measurements and chain surveying: Definition of surveying, classification of surveys, scales, types of chains and tapes, chaining and ranging, principles of chain survey, instruments, applications, errors and corrections, obstacles in chaining.

Compass Traversing: Measurement of bearing, computation of angles from bearings, designation of bearings, fore bearing and back bearing, prismatic compass, principles of compass survey, local attraction and corrections, compass traverse and adjustments.

Plane Table Surveying: Instruments, working operations, different methods, advantages and disadvantages

Module II: (10 Hours)

Levelling: Principle, levelling instruments, dumpy level, classification of levelling, booking and reducing levels, profile (longitudinal and cross section levelling) and reciprocal levelling, curvature and refraction corrections, bubble tube and its sensitiveness, levelling difficulties

Contouring: definition of contouring, contour interval, characteristics of contours, direct and indirect methods of contouring, interpolation of contours, contour gradient, uses of contour maps.

Module III: (08 Hours)

Theodolite surveying: Types of theodolites, temporary and permanent adjustments, measurement of horizontal and vertical angles, theodolite traversing, included angles from bearings, fundamental lines and desired relations, errors in theodolite work, electronic theodolite, plotting a traverse, latitude and departure of lines, consecutive and independent coordinates, closing error, balancing a traverse, Gale's traverse table, omitted measurements, calculation of area

Module IV: (08 Hours)

Curve: Definitions, designation of curve, elements of simple curve, settings of simple circular curve, compound and reverse curve, transition curve, introduction to vertical curve

Tacheometry: Stadia tacheometry, tangential tacheometry and substance tacheometry and Contouring

Electronic Distance Measurement - Basic Principle, classifications, electro-optical system computing distances, electronic total station instruments, types, measurements with total station

Module V: (06 Hours)

Global positioning systems (GPS), Differential Global Positioning System (DGPS), field data collection through satellite, Types of satellite and photogrammetry

Course Outcomes

1. After the completion of this course, students will be able to:
Understand different procedures to survey areas with varied topography.
2. Carry out surveying and record the surveying data for an area using survey instruments.
3. Analyse and appropriately distribute the survey errors.
4. Prepare a plan or map of an area surveyed.
Understand the basics of electronic distance measurement instruments.

Essential Reading

1. Subramanian, R., *Surveying and Levelling*, Oxford (2012)
2. Punmia, B.C., Jain, A.K. and Jain, A.K., *Surveying Vol. I and II*, Laxmi Publications (2016)

Supplementary Reading

1. Basak, N. N., *Surveying and Levelling*, Tata McGraw Hill (1994)
2. Venkatramaiah, C., *A Text Book of Surveying*, Universities Press (1996)

Subject Code: 22CE3PC02T	Subject Name: Mechanics of Materials	L T P: 3 0 0	Credit:3
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Course Objectives

1. To provide the basic concepts and principles of strength of materials.
2. To give an ability to calculate stresses and deformations of objects under external loadings.
3. To give an ability to apply the knowledge of strength of materials on engineering applications and design problems.

Module I: (08 Hrs)

Concept of Stress and Strain: Definition of stress, Normal and Shearing stresses and corresponding strains in axially loaded members, Stress-Strain relationship and its diagram for uniaxial loading for ductile and brittle materials, Stress tensor, Generalised Hooke's Law, Poisson's ratio, relationship between elastic constants, Working stress, Factor of safety. Composite bars in tension and compression, temperature stresses in composite rods

Module II: (08 Hrs)

Beams: Types of loads, supports Shear Force and Bending Moment Diagrams for statically determinate beam with concentrated load, uniformly distributed load, uniformly varying load, Point of Contra flexure.

Module III: (08 Hrs)

Theory of Simple bending: Distribution of bending stresses and shear stress. Slope and deflection of beams by Macaulay's method, Moment area method Conjugate beam method for prismatic members.

Module IV: (08 Hrs)

Transformation of Plane Stress and Plane Strain:

Two dimensional state of stress, principal stresses and principal planes, Mohr's circle of stress, Two dimensional state of strain, principal strains and principal axes of strain, Mohr's circle of strain

Thin Cylinders and Spherical Shells:

Bi-axial Stresses in thin cylinders and thin spherical shells under internal pressure, wire winding of thin cylinder. Introduction to thick cylinder

Module V: (08 Hrs)

Torsion: Torsion formula, strength of solid and hollow circular shafts, design of circular members in torsion, power transmitted, and close coiled helical springs.

Columns: Theory of columns, Long column and short column, Euler's formula - Rankine's formula, Secant formula, Beam column

Course Outcomes

1. Understand the fundamental concepts of stress and strain

2. Evaluate the problems relating to pure and uniform bending of beams and other simple structures. Examine the deflection of beams under various loading condition.
3. Solve torsional deformation of Shafts
4. Understand the concept of crushing and buckling
5. Understand the concept of hoop and radial stress in design of thin and cylinders

Essential Reading

1. S.P.Timoshenko and D.H.Young, *Elements of Strength of Materials*, Affiliated East West Press Pvt. Ltd.
2. E.P.Popov, *Engineering Mechanics of Solids*, Prentice Hall of India Pvt. Ltd., New Delhi.

Supplementary Reading

1. I.H.Shames, *Introduction to Solid Mechanics*, Prentice Hall of India Pvt. Ltd., New Delhi.
2. G.H.Ryder, *Strength of Materials*, ELBS

Course Code	Course Title	L-T-P	Credit
22CM3MC01T	Environmental Science and Engineering	3-0-0	0

ENVIRONMENTAL SCIENCE AND ENGINEERING

Course Objectives:

To provide insight about impact of the humans activities on environment and impact of environment on the humans & its health.

To understand the basic problem of anthropogenic environmental pollution

To gain comprehensive knowledge about the social problem arising out of industrialization.

To familiarize with the environmental ethics and act related to environment

Syllabus:

Module-I [10 Hours]

Ecological Concepts and Natural Resources: Ecological perspective and value of environment. Ecosystem: Concept, structure & Function of ecosystem; Energy cycle, Food Chain, & Food Web; Ecological pyramid, types; Biodiversity; Ecological Succession: Type of ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystem. Geochemical Cycle: Water cycle, Carbon cycle, Oxygen cycle, Nitrogen cycle, etc., Environmental gradients, Tolerance levels of environment factor.

Module-II [8 Hours]

Water Pollution: Types, sources and consequences of water pollution; Ground water Contamination, Waste water treatment process: pretreatment, primary treatment, (Sedimentation, equalization and neutralization etc.), secondary treatment (Activated sludge technique and Trickling filter) tertiary treatment methods (Ion exchange, Electro-dialysis, Electrolytic recovery, reverse osmosis, etc.)

Module-III [10 Hours]

Air Pollution : Air pollution and pollutants, criteria pollutants & non-criteria pollutants, Acid deposition, Global climate change- Green House gases, Ozone Layer Depletion, Smog; Industrial Air Emission Control: Flue gas desulphurization, NO_x removal, . Methods for control

of particulate air pollutants (Mechanical device, Fabric Filtration, scrubber, Electrostatic precipitator), other removal methods like absorption, adsorption, precipitation, etc..

Module-IV **[8 Hours]**

Solid Waste Management Source classification and composition of MSW: properties and separation, storage and transportation, MSW Management, Waste minimization of MSW, Reuse and recycling, Hazardous Waste Management, Hazardous waste and their generation, Transportation and treatment of hazardous waste: Incinerators, Inorganic waste treatment, handling of treatment plant residue. Waste minimization techniques.

Module-V **[4 Hours]**

Noise Pollution: Types, sources and consequences of noise pollution, Physical Properties of sound: sound power, sound intensity and sound pressure levels;, Noise criteria, Noise Standards, Noise measurement, Noise control Methods.

Course outcomes [co]

On Completion of this Course, the students should be able to:

The purpose of the course is to provide an overview of ecosystem and anthropogenic activities effect on natural sources. It's involves understanding the problem arising out of environmental pollution and its remedies. It's involve various case study to analyze the problem face by human due to population growth.

CO	Outcomes	Levels
1.	Able to understand the concept of environmental pollution and its effect on society	Understand Level 2
2.	Able to understand the root of the water pollution problem and adopted for its remedial.	Analyze and Evaluate: Level 3
3.	Able to understand the other environmental pollution problem and adopted for its remedial.	Analyze and Evaluate: Level 3
4.	Able to understand the problem of population growth and its effect on social issue and environment	Analyze and Evaluate: Level 3

Text Books:

1. Gerard Kiely, Environmental Engineering, Tata McGraw Hill, Special Indian Ed, 2007 New Delhi.
2. B.K. Mohapatra, *A Text Book of Environmental Engineering & Safety*, Seven Seas Publication, 4th Ed, 2010, Cuttack
3. L. M. Deshmukh, *Industrial Safety Management*, Tata McGraw Hill Publication, 1st Ed, 2010, New Delhi

Reference Books:

1. Arcadio P. Sincero & Gergoria A.Sincero, *Environmental Engineering: A Design Approach*, Prentice Hall, 1996, Geogia.
1. M. L. Davis and S. J. Masen, *Principles of Environmental Engineering and Science*, McGraw Hill International Edition, 4th Ed, 2019, United Kingdom
2. Curringham & Saigo, *Environmental Science*, TMH, 2016, New Delhi
3. M.C. Dash & P.C. Mishra Man and Environment, Macmillan Publishers India Limited, 1st Ed, 2000, New Delhi
4. Gilbert M. Masters & Wendell P. Ela, *An Introduction to Environmental Engineering and Science*, Prentice Hall, 3rd Ed, 2008, United Kingdom.

Digital Learning Resources

Course Name	Environmental Chemistry & Analysis
Course Link	https://nptel.ac.in/courses/122/106/122106030/
Course Instructor	IIT Madras
Course Name	Environmental Engineering
Course Link	https://nptel.ac.in/courses/103/107/103107084/#
Course Instructor	IIT Roorkee
Course Name	Environmental Air Pollution
Course Link	https://nptel.ac.in/courses/105/102/105102089/#
Course Instructor	IIT Delhi
Course Name	Fundamentals of Environmental Pollution and Control
Course Link	https://nptel.ac.in/courses/123/105/123105001/#
Course Instructor	IIT Kharagpur



Subject Code: 22CE3ES02L	Subject Name: Material Testing Laboratory	L T P: 3 0 0	Credit:3
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List of Experiments

1. Determination of water absorption of bricks
2. Determination compressive strength of brick
3. Determination of Soundness of cement by Lechattelier apparatus
4. Determination of Specific gravity of cement
5. Determination of Standard consistency of cement by Vicat apparatus
6. Determination of Initial and final setting time of cement
7. Determination of specific gravity of aggregate
8. Determination of compressive strength of cement mortar and concrete
9. Determination of specific gravity of bitumen
10. Determination of penetration value of bitumen
11. Determination of workability test of concrete

Course Code:	Course Name:	L-T-P:	Credit:
22CM3ES01L	Data Structure using C Laboratory	0-0-2	01

Prerequisites Programs:

1. Create a structure that stores a point in 2D. Accept 3 such points and find out the area of the triangle enclosed by these three points.
2. One array of numbers to be sorted. The no of element of the array is an user input. Create the array dynamically, accept its members and sort the array.

Programs for Evaluation Lab:

1. (Integer stack simulation) Write a structure for an integer stack, implement function push, pop, and pick, IsEmpty and IsFull function. Write a main function and call the functions based on an option entered.
2. (Palindrome checking using stack) Implement a stack of characters and create mystack.h. Write a program to check whether an entered string is a palindrome or not. One need to include mystack.h for calling the functions of character stack.
3. (Simulating circular queue) Defining structure of a circular queue (with a counter), write functions for inserting, deleting and counting no of elements present in the queue. Write functions IsFull and IsEmpty also. Write main function to call them.
4. (Infix to Postfix) Write a program to convert an infix expression into its corresponding postfixexpression. The expression contains alphabets, operators and parentheses. During the conversion allpossible checks for the correctness should be checked. [(a+b)/(c-d) would output ab+cd-/, ((a+b)^c-dwould give error as “unmatched parenthesis]
5. (Insertion sort) A singly linked list gives a better way to implement insertion sort. A flat file contains some unknown number of integers. Implement insertion sort using a singly linked list that reads the next integer from the file and insert it into a linked list in its proper position. Write a function that prints the list after all elements is properly inserted into the linked list.
6. (Polynomial addition) Represent a polynomial of a single variable using a singly linked list. Write functions createPolynomial that stores one polynomial in a singly linked list. Write a function to add two such linked lists.

7. (BST simulation) Declare a binary search tree where information at each node would be a single integer. Write functions for inserting a key, deleting a key from the tree. Write recursive traversal routines. After each insertion/deletion find all traversal results.
8. (Bubble sort) One array of numbers to be sorted. The no of element of the array is a user input. Create the array dynamically, accept its members and sort the array using bubblesort algorithm. Also count the total number of swaps.
9. (Quick sort) Write a function to implement recursive quick sort algorithm and using this function sort an array of integers. Write another function to search for a key in this sorted array using binary search.
10. (Merge Sort) Implement recursive merge sort using an array of fixed size and hence sort an array of double numbers using this function.

Subject Code: 22CE3PC01L	Subject Name: Surveying Laboratory	L T P: 3 0 0	Credit:3
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List of Experiments

1. Study and use of chains, tapes, compass, theodolite and plane Table (Two labs)
2. Horizontal & Vertical Angle measurement using Theodolite
3. Calculate the reduced level of points by rise and fall method and height of collimation method using dumpy level
4. Longitudinal and Cross Sectional profile of a given road segment using dumpy level
5. Profiling and crosschecking with total station
6. Layout of a building and map generation with total station (Two Labs)
7. Setting out of a Simple Circular Curve
8. Setting out of a Reverse Curve
9. Contour map preparation using RLs calculated from staff readings of dumpy level
10. Use of DGPS for plotting the map of institute

Subject Code: 22CE3PC02L	Subject Name: Mechanics of Materials Laboratory	L T P: 3 0 0	Credit:3
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List of Experiments

1. Tension test on steel for finding stress and strain and Young's modulus.
2. Shear force and bending moment diagrams for different types of beams with different loading conditions
3. Determination flexural strength of concrete
4. Determination bending test of steel
5. Finding the deflection of simply supported beam
6. Finding the deflection of overhanging beam
7. Construction of Mohr's circle
8. Torsion test on mild steel
9. Forces in the simple truss
10. Mix Design of M25 grade of concrete
11. Field visit of construction site and draw the SFD, BMD and Point of contraflexure